AN EXPOSURE METHOD UTILIZING OPTICAL PROXIMITY CORRECTED
EXPOSURE PATTERNS, AN APPARATUS FOR GENERATING OPTICAL
PROXIMITY CORRECTED EXPOSURE DATA, AND AN EXPOSURE
APPARATUS FOR OPTICAL PROXIMITY CORRECTED EXPOSURE DATA

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BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an exposure method
which utilizes exposure patterns that have undergone an
10 optical proximity correction (OPC), an apparatus for
generating optical proximity corrected exposure data, and
an exposure apparatus for the optical proximity corrected
exposure data.

2. Description of the Related Arts

15 An optical proximity effect is known in which, in
LSI exposure step, according to a frontward dispersion
and rearward dispersion of exposure beams, a pattern is
expanded in a region where a pattern density is high and
a pattern is thinned in a region where the pattern density
20 is low. According to such the optical proximity effect,
when a pattern is exposed on a reticle mask and developed
in accordance with the exposure data generated from design
data, and further the pattern is exposed on a chip and
developed by utilizing the reticle mask, the pattern of
25 the reticle and the pattern of a wafer lead to a profile
different from the original exposure pattern.

Fig. 1 is a diagram showing one example of the optical

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proximity effect. Fig. 1 shows how two kinds of pattern 1, 2 change by the optical proximity effect in the exposure pattern (1), the pattern on the reticle (2), and the pattern on the wafer (3). The square pattern 1 is a rectangular profile whose four corners are made at 90° in the exposure pattern, but when the reticle is exposed with laser beams, electron beams, or the like by utilizing the exposure pattern and developed, the pattern on the reticle leads to a profile whose four corners are slightly rounded like a pattern 1A. Furthermore, when the wafer is exposed by utilizing the reticle pattern and developed, the pattern to be formed on the wafer leads to a profile whose four corners are rounded like a pattern 1B, as shown in Fig. 1, and the square becomes approximately a round shape. This occurs by a cause that the frontward dispersion and rearward dispersion from peripheries are scarcely affected at the corners, and this cause is equal to a cause that leads to a phenomenon that a top end of a line pattern becomes a round profile, and further is thinned.

Furthermore, in the case where other patterns 3, 4 are present in proximity to the linear pattern 2, a slightly expanded profile is obtained in positions confronting the patterns 3, 4 on the reticle, as shown in a pattern 2A. This occurs by a cause that the frontward dispersion and rearward dispersion are generated due to exposure energy to the patterns 3, 4, and influences from a more proximal pattern 4 are greater. And, further when

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the wafer is exposed and developed by exploiting the
reticle pattern, a largely expanded profile is obtained
in positions confronting the patterns 3, 4, as shown in
a pattern 2B.

5   Fig. 2 is a diagram for explaining the optical
proximity correction (OPC). Taking into consideration
the optical proximity effect of Fig. 1, a serif pattern
1C is added to the four corners of the square exposure
pattern 1, and the reticle pattern 1A and the pattern 1B
10 on the wafer are formed by exposing and developing
according to the OPC corrected exposure pattern. The
reticle pattern 1A is deformed to a profile that the
corners are rounded by the optical proximity effect, and
the corner of the wafer pattern 1B becomes a sharp
15 right-angled profile. Furthermore, in the linear
exposure pattern 2, a recess part 2C is added to the
positions confronting the patterns 3, 4, and the exposure
and development are made by the OPC corrected exposure
pattern. As a result, a slightly recessed profile 2D is
20 obtained in the reticle pattern 2A and a flat line profile
is obtained in the wafer pattern 2B.

The above-described OPC is similarly effective even
in the case where the exposure and development are made
by drawing directly on the wafer with the electronic beams
25 according to the exposure pattern data.

As set forth above, it is possible to restrict a
profile change of the patterns after being exposed and

developed accompanied by the optical proximity effect by
making the OPC in the exposure pattern, and to increase
the pattern precision. However, in the OPC corrected
exposure pattern, a simple square or rectangle is not
5 formed in the aforementioned example, thereby causing an
increase in the number of exposure patterns. Such the
increase in the number of exposure patterns leads to an
increase in an exposure data amount, and an increase in
a transfer time of the exposure data to an exposure
10 apparatus, and an increase in a rendering time for
bitmapping in the exposure apparatus, and a reduction in
a throughput in an exposure step.

SUMMARY OF THE INVENTION

It is therefore the object of the present invention
15 to provide an exposure method which restricts an increase
in the number of the optical proximity corrected exposure
patterns, an exposure data processing apparatus, and an
exposure apparatus.

In order to attain the above object, according to
20 one aspect of the present invention, in the exposure method
which carries out optical proximity correction processing
for exposure data having a plurality of exposure patterns
and exposes a sample in accordance with such corrected
exposure data, the exposure patterns to be corrected are
25 converted, in the optical proximity correction processing,
into a minus objective pattern and a minus pattern to be
deleted from the minus objective pattern, to form

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corrected exposure data. And, the minus pattern is
deleted from the minus objective pattern of the corrected
exposure data to bitmap a corrected exposure pattern, to
expose a sample in accordance with such bitmapped
5   corrected exposure pattern.

        According to a preferred embodiment in the present
invention, in the case where the OPC is made for a corner
rounding of the exposure pattern, the corrected exposure
data having the minus objective pattern which is generated
10   by enlarging the exposure pattern to be corrected and the
minus pattern positioned at a side central part of such
minus objective pattern is generated. And, the corrected
exposure pattern which partially enlarges the corners of
the exposure pattern to be corrected is generated by
15   bitmapping. As these corrected exposure data are
configured by the enlarged minus objective pattern and
the minus pattern to be deleted, it is possible to restrict
the increase in the number of patterns, and to restrict
the increase in the data amount.

20   According to another preferred embodiment, in the
case where the OPC is made to the linear exposure pattern
so as to prevent an enlargement at positions confronting
the other patterns in proximity to the linear exposure
patterns, corrected exposure data having the minus
25   objective patterns consisting of such exposure pattern
to be corrected and the minus patterns in the positions
confronting the other patterns are generated as the

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corrected linear exposure pattern. And, the corrected
exposure pattern in which the linear exposure pattern to
be corrected is partially thinned is generated by the
bitmapping. According to these corrected exposure data,
5 the increase in the number of pattern can be restricted.

According to a further preferred embodiment, in the
aforementioned optical proximity correction processing,
by comparing the case where the exposure pattern to be
corrected are converted into a first corrected exposure
10 data having the plurality of exposure patterns obtained
by dividing the corrected exposure patterns with the case
where the exposure pattern to be corrected are converted
into a second corrected exposure data having the minus
objective pattern and the minus pattern, the exposure
15 pattern to be corrected is converted into the corrected
exposure data with the smaller number of patterns.
According to this embodiment, the exposure pattern to be
corrected can be converted into the corrected exposure
data with the fewer number of patterns.

20   BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram showing one example of an optical
proximity effect;

Fig. 2 is a diagram for explaining an optical
proximity correction (OPC);

25   Fig. 3 is a flowchart in a general exposure data
processing apparatus and exposure apparatus;

Fig. 4 is a diagram for explaining a first OPC

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processing;

Fig. 5 is a flowchart in an exposure data processing apparatus and exposure apparatus in the case where a second OPC processing is carried on;

Fig. 6 is a diagram for explaining a second OPC processing;

Fig. 7 is a flowchart of the OPC processing in this embodiment;

Fig. 8 is a diagram showing a serif correction;

Fig. 9 is a diagram showing a line correction;

Fig. 10 is a diagram showing a schematic configuration of the exposure apparatus;

Fig. 11 is a configuration diagram of a bitmap processing unit; and

Fig. 12 is a logic table of the bitmap processing unit.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, the embodiments of the present invention will be described with reference to the drawings. It is however to be understood that the scope of protection of the present invention is not limited to the following embodiments, but covers the invention defined in the claims and its equivalent.

Fig. 3 is a flowchart in a general exposure data processing apparatus and exposure apparatus. In the exposure data processing apparatus, design data DB1 are subjected to a data conversion processing in accordance

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with data conversion information DB2 (S1), and as the result, exposure data DB3 having the plurality of exposure patterns each designating an exposure region is generated. The data conversion information DB2 are parameters

5   containing a power, a shift amount, and the like which correspond to a reticle to be exposed and developed. For example, in the case of rectangular patterns, the generated exposure data DB3 have an origin coordinate, a width and a height, and attribute data such as a profile

10 code, etc. The exposure pattern comprises a quadrilateral rectangular pattern, a triangular pattern, a trapezoid pattern, and the like, and these profile codes are given as the attribute data. In the case of the triangular pattern, the exposure data have the origin

15 coordinate, a length of a bottom side and a height, and the like, and in the case of the trapezoid pattern, the exposure data have the origin coordinate, lengths of an upper bottom and a lower bottom and a height, and the like.

        Next, in order to cope with the optical proximity

20 effect, the OPC processing is carried out with respect to the exposure data (S2), to generate the corrected exposure data DB5. In the OPC processing S2, the exposure patterns to be corrected are converted into the corrected exposure patterns in accordance with an OPC model table

25 DB4. The OPC model table DB4 is a lookup table having the correspondence of the exposure patterns to be corrected to the corrected exposure patterns. This corrected

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exposure patterns are divided into, for example, a
plurality of patterns, to generate corrected exposure data
DB5 having these division patterns.

These corrected exposure data DB5 are supplied to
5   the exposure apparatus, and the plurality of patterns
included in the corrected exposure data are bitmapped (S3),
and a resist on the reticle is exposed by the bitmapped
pattern (S4). The bitmapping processing S3 is a
processing of rendering the exposure pattern in accordance
10 with the corrected exposure data DB5 which specifies the
exposure patterns.

The steps S1, S2 of the aforementioned flowchart are
carried on by an exposure data processing apparatus, and
the steps S3, S4 are carried on by the exposure apparatus.
15 Normally, the exposure apparatus is configured by a
processing unit for bitmapping the exposure data generated
by the exposure data processing apparatus and an exposure
unit which activates exposure beams according to the
bitmap data, while irradiating the exposure beams to a
20 sample such as a reticle, or the like.

Fig. 4 is a diagram for explaining a first OPC
processing. In the same manner as Figs. 1 and 2, Fig. 4A
shows the OPC processing with respect to the corner
rounding of the exposure pattern, and Fig. 4B shows the
25 OPC processing with respect to a thinning of the linear
exposure pattern. In the OPC processing with respect to
the corner rounding of the exposure pattern, a serif

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correction pattern 10C is added to corners of the exposure
pattern to be corrected 10. And, the exposure pattern to
be corrected 10 and the serif correction pattern 10C are
combined to form a corrected exposure pattern 10D, which

5 is divided into a plurality of rectangular patterns. In
this example, the corrected exposure pattern is divided
into seven rectangular patterns d1 to d7. Namely, the
exposure pattern to be corrected 10 is converted into the
corrected exposure data DB5 consisting of the seven

10 rectangular patterns d1 to d7. As the result, such the
corrected exposure data are rendered to bitmap, and a
sample such as a reticle, or the like is exposed to beams
in accordance with the bitmap data, and is developed, so
that a correction exposure pattern 10E is formed on the

15 reticle.

Incidentally, the OPC with respect to the corner
rounding can similarly be carried on even in the trapezoid
pattern or triangular pattern other than the rectangular
pattern by similarly adding the serif correction pattern

20 to the corners to partially enlarge them.

In the OPC processing with respect to the linear
exposure pattern of Fig. 4(B), a line correction pattern
20C is removed in positions confronting proximal other
exposure patterns 23, 24, 25 with respect to a linear

25 pattern 20 of to be corrected. And, the removed corrected
exposure pattern 20D is decomposed to the plurality of
rectangular patterns. In this example also, the

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corrected exposure pattern 20D is divided into the seven rectangular patterns d1 to d7. The corrected exposure data DB5 consisting of the seven rectangular patterns are bitmapped to be exposed and developed, so that a correction exposure pattern 20E is formed on the reticle.

When the above corrected exposure pattern is divided into the plurality of rectangular patterns, the number of divided rectangular patterns is increased according to profiles of the corrected exposure patterns. In the example of Fig. 4, the exposure pattern to be corrected 10 consisting of a single rectangular pattern is converted into the corrected exposure pattern 10D consisting of the seven rectangular patterns. Furthermore, the exposure pattern to be corrected 20 consisting of a single linear pattern is converted into the corrected exposure pattern 20D consisting of the seven rectangular patterns. Accordingly, when the above first OPC processing is carried on, this leads to a fair increase in the number of patterns.

Fig. 5 is a flowchart in the exposure data processing apparatus and the exposure apparatus in the case where a second OPC processing is carried out. Furthermore, Fig. 6 is a diagram for explaining the second OPC processing. As shown in Fig. 5, in the exposure data processing apparatus, the design data DB1 are subjected to a data conversion processing according to the data conversion information DB2 (S1), to form the exposure data DB3. This

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exposure data conversion processing is same as in the case
of Fig. 3. Next, in the OPC processing S2, the exposure
pattern to be corrected within the exposure data is
converted into a minus objective pattern DB5A and a minus

5   pattern DB5B in accordance with the OPC model table DB4,
to form the corrected exposure data DB5. The exposure
pattern to be corrected is converted into the minus
objective pattern DB5A and the minus pattern DB5B, thereby
restricting the increase in the number of patterns.

10   In the OPC processing with respect to the corner
rounding of the exposure pattern of Fig. 6A, for example,
the rectangular pattern to be corrected 10 is converted
into an enlarged pattern 10L which is obtained by enlarging
the pattern to be corrected 10 at a certain ratio and a

15 rectangular minus pattern 10M positioned at a center part
of four sides of the enlarged pattern. The enlarged
pattern 10L is enlarged to such a profile which is
generated by connecting the four corners when the serif
correction patterns are added to the pattern to be

20 corrected 10. This enlarged pattern corresponds to the
minus objective pattern DB5A. Furthermore, the four
rectangular minus patterns 10M to be deleted from the
enlarged pattern 10L are formed.

        Return to Fig. 5, the corrected exposure data DB5

25 is supplied to the exposure apparatus, and such a
processing is carried out that a portion of the minus
pattern 10M is deleted from the enlarged pattern 10L of

the corrected exposure data DB5 to bitmap the exposure region (S10). And, the exposure beams are irradiated on the reticle in accordance with the bitmapped exposure data to be exposed (S4). As the result, the exposed and developed pattern 10E on the reticle is an exposure pattern which is subjected to the OPC processing. Namely, in the same manner as in Fig. 4A, the reticle pattern 10E has a profile that the four corners are partially enlarged.

As shown in Fig. 6A, the pattern to be corrected 10 is converted into the enlarged pattern 10L and the four minus patterns 10M, and the number of patterns is five in total. And, the number of patterns is lessened in comparison with seven in the case of the first OPC processing shown in Fig. 4A.

In the OPC processing with respect to a bold state of the linear exposure pattern of Fig. 6B, the pattern to be corrected 20 is set to the minus objective pattern as is, and further the minus pattern 20M for thinning the positions confronting the proximal other patterns 23, 24, 25 is generated. In this example, as the three proximal other patterns are present, the three minus patterns 20M are generated in the positions confronting the other patterns. In this case, the pattern to be corrected 20 is converted into four patterns in total, consisting of the existent pattern 20 and the three minus patterns 20M. The number of pattern is lessened in comparison with seven in the case of the first OPC processing shown in Fig. 4(B).

Then, returning to Fig. 5, the existent pattern 20 is set to the minus objective pattern, and the corrected exposure data DB5 to which the minus pattern 20M to be removed therefrom is added are supplied to the exposure apparatus. And, the minus pattern is removed from the minus objective pattern to bitmap the exposure region (S10), so that the corrected exposure pattern is bitmapped. The beam exposure is made on the reticle according to the bitmap data of this corrected exposure pattern, so that the exposure pattern 20E which is subjected to the OPC processing on the reticle is generated.

Fig. 7 is a flowchart of the OPC processing in this embodiment. In this embodiment, in the case of the OPC processing, the exposure pattern to be corrected is converted into any one of the first corrected exposure data having the plurality of exposure patterns obtained by dividing the corrected exposure pattern by the first OPC processing and the second corrected exposure data having the minus objective pattern and the minus pattern by the second OPC processing. In selecting either one, the data with the smaller number of patterns of the corrected exposure data are selected.

As shown in Fig. 7, in the OPC processing S2, it is detected with reference to the OPC rule table DB4 whether or not the exposure pattern of the exposure data DB3 before being OPC-corrected is an exposure pattern to be corrected, and in the case of a serif exposure pattern to be corrected

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(S20), it is subjected to the second OPC processing, to produce an enlarged pattern DB10 obtained by enlarging the exposure pattern to be corrected at a certain ratio and a minus pattern DB11 (S22), as described above. In the case of the serif correction, in any one of the exposure patterns to be corrected of a rectangle, a trapezoid and a triangle, the number of patterns is lessened in the corrected exposure data having the enlarged pattern and the minus pattern by the second OPC processing rather than by the first OPC processing. Accordingly, the serif exposure pattern to be corrected is uniformly subjected to the second OPC processing.

Fig. 8 is a diagram showing a serif correction. As shown in Fig. 4A, when the rectangular is subjected to a serif correction by the first OPC, the number of pattern reaches seven times, and on the other hand, as shown in Fig. 6A, when the rectangular is subjected to a serif correction by the second OPC, the number of pattern is limited to five times. Accordingly, it is understood that, in the serif correction with respect to the rectangular pattern, the second OPC processing is more advantageous.

In Fig. 8A, the exposure pattern 30 of a trapezoid is subjected to a first OPC processing OPC1, and when the exposure pattern after being corrected is divided in a horizontal direction, it is understood that the division patterns d1 to d7 and the number of patterns reaches seven times. On the other hand, when the exposure pattern 30

is subjected to a second OPC processing OPC2, and the exposure pattern to be corrected is converted into five patterns in total of an enlarged pattern 30L as the minus objective pattern and four minus patterns 30M.

5   Accordingly, in the case of the trapezoid exposure pattern also, the second OPC processing is more advantageous.

Fig. 8B shows a comparable example with respect to the a triangular exposure pattern 40, and when the exposure pattern 40 is subjected to the first OPC processing OPC1,
10   the number of pattern reaches five times, and on the other hand, when the exposure pattern 40 is subjected to the second OPC processing OPC2, the number of pattern is limited to four times. Accordingly, in the case of the triangular exposure pattern also, the second OPC
15   processing is more advantageous. Incidentally, the reason that a horizontal division is made in the first OPC processing is that beams are swept in a horizontal direction in the beam exposure.

Returning to Fig. 7, in the case where the exposure
20   pattern to be corrected is subjected to a line correction, either the first OPC processing or the second OPC processing is selected depending on the exposure pattern to be corrected.

Fig. 9 is a diagram for explaining such the line
25   correction. Fig. 9A shows the OPC of an exposure pattern to be corrected 50 having proximal exposure patterns 51, 52. In this case, in order to prevent that the exposure

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pattern to be corrected 50 are enlarged after being exposed and developed in an opposite side 53confronting the proximal exposure patterns 51, 52, a recess part 50M is provided in an OPC exposure pattern 50E. In this case, when they are subjected to the first OPC processing, five division patterns are obtained, but when they are subjected to the second OPC processing, total three patterns of the single existent pattern 50 and the two minus patterns 50M are obtained. Accordingly, the second OPC processing is more advantageous.

Fig. 9B shows the OPC of an exposure pattern to be corrected 60 having a proximal exposure pattern 61. In this case, in the first OPC processing, the three division patterns are obtained, but in the second OPC processing, the total two patterns of a single existent pattern and a single minus pattern 60M are obtained. Accordingly, the second OPC processing is more advantageous.

Fig. 9C shows the OPC in the case where a proximal exposure pattern 71 is included in a top end part of a line pattern 70. In this case, in both the first and second OPC processings, a correction exposure pattern 70E has two patterns.

In the above three cases, the number of vertex n at a side provided with a recess part is investigated, and as shown in the figure, n=2 before being corrected, and on the other hand, n=10, n=6, and n=4 after being corrected, respectively. Accordingly, comparing the number of

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vertex before being corrected with after being corrected, in the case where the difference exceeds 2, the number of patterns is smaller in the second OPC processing, and in the case where the difference in the number of vertex is 2 or less, it is understood that, in the first OPC processing also, the number of patterns is not fairly increased.

Returning to Fig. 7, in the OPC processing, in the case where the exposure pattern to be corrected corresponds to a line correction, it is judged in step S24 whether or not the number of vertex of a side forming the recess part exceeds 2 between before being corrected and after being corrected. When the number of vertex exceeds 2, the second OPC processing is carried out (S26), and a minus pattern DB13 with respect to an existent pattern DB12 which is a minus objective pattern is generated. When the number of vertex does not exceed 2, the first OPC processing is carried out (S28), and a division pattern DB14 is generated.

In the patterns DB10 to DB14 generated by the above OPC processing, the minus objective patterns DB10, DB12 and the division pattern DB14 are combined as a normal pattern DB5A, and the minus patterns DB11, DB13 are combined as the minus pattern DB5B (S30). And, in a format conversion processing of the exposure data, a new figure code is assigned to the minus pattern DB5B, and a normal figure code is assigned to the normal pattern DB5A. Here,

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the figure code means a code indicating a rectangle, a trapezoid (including a parallelogram), and a triangle, and is utilized in a rendering processing to be described later. Furthermore, the figure code is allocated so as to distinguish the normal pattern DB5A from the minus pattern DB5B, thereby simplifying a processing of removing the minus pattern from the normal patterns in the rendering processing to be described later.

The corrected exposure data DB5 are generated by the above OPC processing, and are supplied to the exposure apparatus to be described later.

Fig. 10 is a diagram showing a schematic configuration of the exposure apparatus. This example is a laser beam exposure apparatus. Laser beams generated by a laser beam source 80 pass through a reflection mirror 81, an on/off switch 82 and a reflection mirror 83, and are irradiated to a scan mirror 84. The scan mirror 84 is a polygon mirror and scans the laser beams in a horizontal direction by rotating it. The laser beams pass through an object glass 85 and are irradiated to a reticle 87 mounted on a stage 86.

The stage 86 moves in a vertical direction by a motor 89. The scan mirror 84 is rotated according to a horizontal synchronous signal Hsync generated by a scan timing control part 90, to sweep the laser beams to a horizontal direction. Furthermore, the stage 86 moves according to a vertical synchronous signal Vsync, to scan

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the laser beams in a vertical direction. Thus, the laser
beams raster-scans the reticle.

The exposure apparatus further has a bitmap
processing unit 88 for bitmapping the exposure pattern
included in the corrected exposure data DB5. This bitmap
processing unit 88 produces the exposure pattern in a
designated coordinate position according to the exposure
data, and renders the exposure pattern, thereby producing
a dot signal DOT indicating on/off of the beam irradiation
at pixels. This dot signal DOT is output at a timing in
synchronism with the aforementioned horizontal
synchronous signal Hsync and vertical synchronous signal
Vsync, and is supplied to the on/off switch 82.

Fig. 11 is a configuration diagram of the bitmap
processing unit. This bitmap processing unit comprises
a figure code judgment part 92 for judging a figure code
of pattern data included in the corrected exposure data
DB5; dot signal conversion parts 93, 94 for converting
the pattern into a dot signal; and NOR gates 95, 96. The
figure code judgment part 92 judges the normal figure code
and the minus figure code which are provided by the format
conversion processing of Fig. 7, and the normal pattern
provided with the normal figure code is supplied to a dot
signal conversion part 93, and the minus pattern provided
with the minus figure code is supplied to a dot signal
conversion part 94. And, when the respective dot signals
A, B pass through the two NOR gates 95, 96, the dot signal

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deleting the minus pattern from the normal pattern is
generated.

Fig. 12 is a diagram showing a logic value table of
the two NOR gates. When the dot signal B of the minus
pattern is "1" at the time of the dot signal A of the normal
pattern being "1," the dot signal DOT becomes "0" (off) by
a deletion. Furthermore, when the dot signal B of the
minus pattern is "0" at the time of the dot signal A of
the normal pattern being "1," the dot signal DOT becomes
"1" (on) without the deletion. And, at the time of the
dot signal A of the normal pattern being "0," the dot signal
DOT becomes "0" (off). The on/off switch 82 within the
exposure apparatus on/off-controls the laser beams
according to this dot signal DOT.

As above, it is possible to realize the processing
of removing the minus pattern from the minus objective
pattern by a simple logic circuit. Accordingly, by
introducing a concept of the minus pattern, it is possible
to restrict an increase in a data mount of the exposure
data, and an improvement in the exposure apparatus side
following the increase is extremely slight.

The above embodiments were explained with the laser
beam exposure apparatus as an example, but the present
invention can be also applied to an exposure apparatus
in which electronic beams or electric charge particle
beams are irradiated on the reticle or wafer to draw the
exposure pattern.

Hereinabove, according to the present invention, it
is possible to restrict the increase in the number of
patterns of the corrected exposure data which are
subjected to the optical proximity correction, and to make
5   easy a handling such as a transfer, a processing, or the
like of the exposure data.